CORROSION TESTS OF GASOLINE SAFETY CANS

Coast Guard
Baltimore, Maryland

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UNITED STATES COAST GUARD

ADDRESS REPLY TO:
COMMANDING OFFICER
FIELD TESTING AND DEVELOPMENT UNIT
U.S. COAST GUARD YARD
CURTIS BAY, BALTIMORE 26, MD.

3982/02/02
19 November 19

From: Commanding Officer, Field Testing & Development Center
To: Commandant(ETD)

Subj: Project 3982/02/02, Corrosion Tests of Gasoline Safety Cans

Ref: (a) Comdt(ETD) ltr 3982/02/02 Ser 1086 of 26 October 196

1. Reference (a) advised that some of the gasoline safety cans purchased by the Coast Guard under Federal Spec RR-S-30A have failed in service. The failures have been due to localized pitting on the interior of the cans as a result of the steel coating material being broken during fabrication. Safety cans built to the above specification are made from terne plate. It has been suggested that hot tin dipped containers be used and some cans of this construction are now in the Coast Guard Supply System. Theoretically, a steel can coated with a material anodic to steel, such as a galvanized coating, would afford the greatest protection in a marine atmosphere. The purpose of this project was to compare the corrosion resisting performance of three different safety cans, one each of the above mentioned types. A 240-hour Salt Spray test was specified.

2. A safety can with a hot dipped galvanized coating could not be located. One of the Larger manufacturers of safety cans indicated that the approval of Underwriters' Lab and Factory Mutual was not extended to safety cans with a galvanized surface. However, a 5-gallon oil can made from hot dipped galvanized steel without the spring-loaded spout cap was obtained and was used in the tests. The three cans tested are shown in Enclosure 1 and are identified as follows, viewed from left to right.

CAN A - A galvanized oil can of 5-gallons capacity. Seamless drawn from hot dipped, 26 gauge steel. Exterior surface painted yellow. Fitted with a fill cap, pour spout with cap and wood carrying handle. No screens or strainers or spring loaded closures - not a "safety" can. Manufactured by Eagle Manufacturing Company, Wellsburg, W. Va. and identified as their No. 405-NS. Procured from CG YARD Supply at a cost of $2.75.

CAN B - Manufactured by Protectoseal Company, Chicago Illinois. A heavy, well built safety can, 5-gallon capacity, No. 4615. This can has a single top opening with spring loaded cap. Spout is fitted with an internal screen of fine mesh referred to as a "fire baffle". This can has the Underwriters' Laboratory label soldered on and the Factory Mutual diamond marking embossed.

This can is hot tin dipped and has no other coating. It is not seamless drawn but is rolled up and has a vertical seam and circumferential seams at top and bottom. Top and vertical seams appear to be crimped and bottom seam rolled with an additional retaining ring soldered at the bottom. The lever for lifting the gasketed cap against spring force is riveted to the can lifting handle which itself is not movable. This can is available from the CG Supply Center, Brooklyn, New York, under stock no. CG-7240-600-1833 for $17.46.

CAN C - This can, manufactured by Eagle Manufacturing Company, is a 5-gallon safety can with the UL label spot welded on and the FM diamond embossed. The single filling and pouring spout has a spring loaded, gasketed cap which is operated by the lifting handle when a notched lever from the cap is depressed to engage a fixed pin in the movable handle. This can has a seamless drawn body with a crimped circumferential seam at the top, possibly seam welded. Can material is 24-gauge terne coated steel and can exterior is painted red. There are no screens or flame arrestors. This can was procured commercially at a cost of $7.16.

3. Before subjecting the three cans to salt spray they were weighed and checked for ease of handling and liquid tightness. Each can was filled with water and tipped upside down, primarily to check the sealing ability of the spring loaded pour spouts of the two safety cans. There was no leakage from any of the cans.

Empty can weights were as follows:

CAN A - 4 lbs - 5 oz.
CAN B - 8 lbs - 14 oz.
CAN C - 6 lbs - 2 oz.

Can B was considered easier to hold open and pour from than Can C, the other safety can.

4. To permit a comparison between internal and external corrosion, each can was cut vertically using a power saw. The cuts were made just behind the pour spouts and the section without the pour spout was used for the salt spray tests. X shaped scribe marks were made on both sides of all can sections through the coating to the base metal. The thickness of the coating or coatings over the base steel was measured using an Elcometer dry film thickness gauge.

Results were as follows:

	Exterior	Interior
CAN A	3.5 mils	1 mil
CAN B	1-2 mils	1-2 mils
CAN C	1 mil	$\leq$ 1 mil

5. The three cut sections were subjected to a salt spray test in accordance with ASTM-B-117-57T. Positions of the three sections were changed daily and observations made of the progress of corrosion. Significant observations were as follows:

After 27 hours salt spray:

CAN A - (galvanized) - No corrosion.

CAN B - (tin dipped) - Considerable corrosion at seams and cut edges.

CAN C - (terne plate)- Slight corrosion at seams and cut edges.

After 142 hours salt spray:

CAN A - No evidence of corrosion but considerable amount of white deposit through out interior and particularly at cut edges and scribed marks.

CAN B - Pronounced amount of corrosion at seams, cut edges and scribe marks.

CAN C - Slight increase in corrosion over that observed at 27 hours.

After 238 hours:

CAN A - Yellow paint coat was flaking off exposing galvanize beneath. Very extensive loose calcareous deposit throughout and some rust staining appeared on the bottom of can interior and near the filling cap.

CAN B - Extensive rusting at seams, cut edges and scribe marks.

CAN C - Moderate rust at seams, cut edges and scribe marks. Red paint coat was completely intact with no visible degradation.

Enclosure (2) is a photographic record of the above. Figures A1, A2, A3 and A4 show the exterior surface of the three can sections; before salt spray, after 27 hours, after 142 hours and after 238 hours. Figures B1, B2, B3 and B4 are corresponding views of the interior sections.

6. Some conclusions which may be drawn from the above observations are:

a. The galvanized coating offers cathodic protection to the base metal in the event of a break or imperfection in the coating. The terne coating and tin coating do not afford this protection.

b. The large amount of white deposit which formed on the zinc surface, presumably zinc carbonate, could contaminate the liquid contents of a container.

c. The corrosion which appeared quickly at the seams of the terne plate and tin dipped containers indicated that these coatings were either porous or mechanically damaged during manufacture. In this respect the hot tin dipped container was the worst.

7. We propose to conduct salt spray tests on the remaining container sections which will include the UL label plate. Also, we understand that a fourth container will be forwarded for evaluation. The results of these additional tests will be combined with this preliminary report and a formal project report prepared.

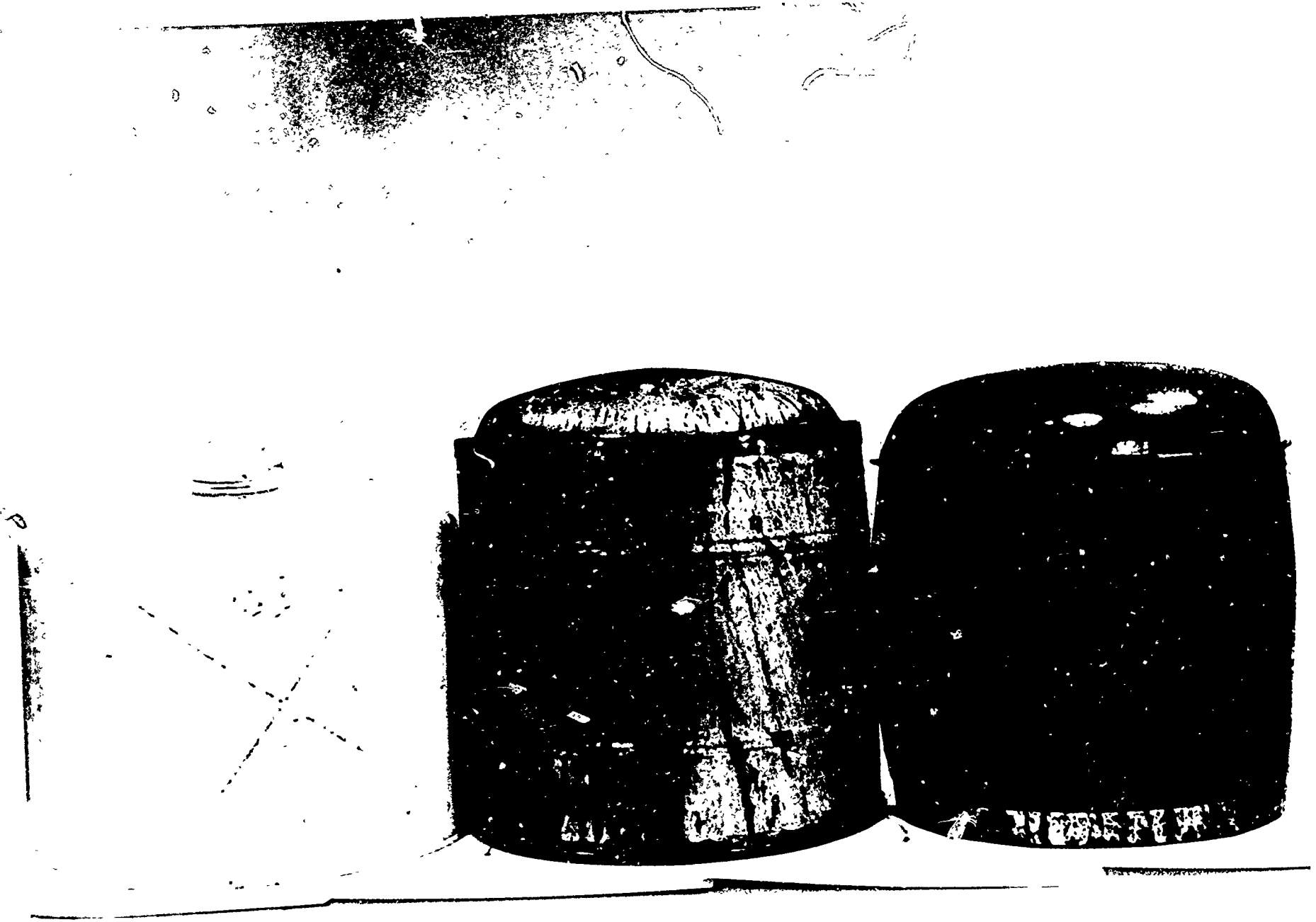
P. O. CHAPMAN

Encl: (1) Photographs (1 each)
(2) Photographs (8 each)

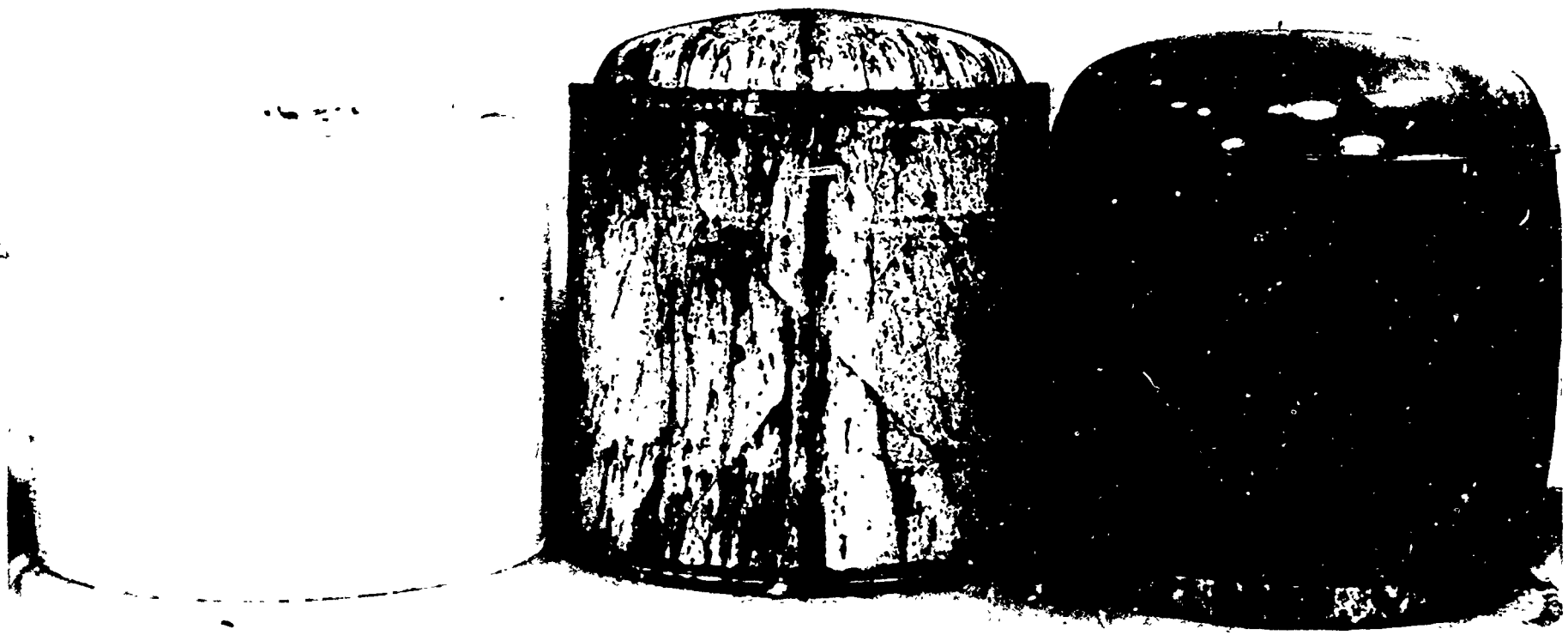
ENCL: 1

ENCL: 2 A1

ENCL: 2 A2



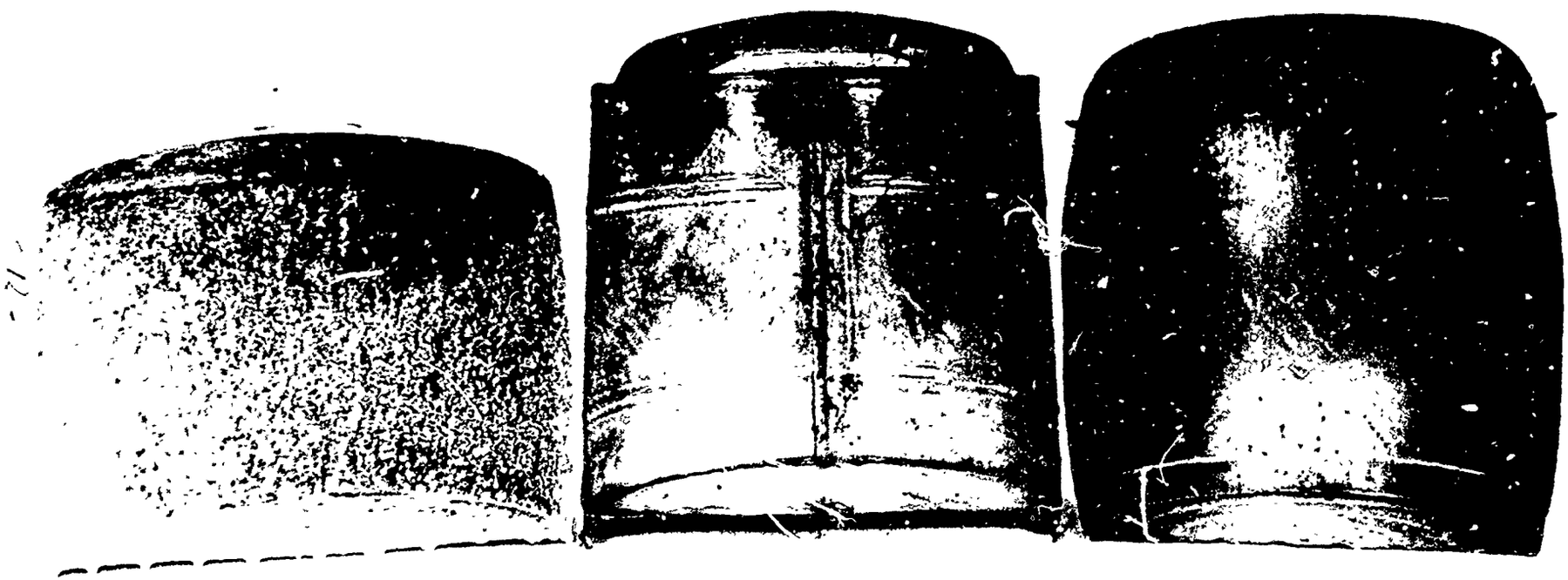
ENCL: 2 A3



ENCL: 2 A4

ENCL: 2 B1

ENCL: 2 (2)



ENCL: 2 B3

ENCL: 2 B4